

THE GENUS *PTERIS* OF COSTA RICA

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This paper on *Pteris* is the second of my studies of a genus of Costa Rica ferns. The first on *Adiantum* was published in *Contributions from the Gray Herbarium* 187: 3-22. 1960.

This small country is truly a fern lover's paradise, and the days I spent collecting there during February and March, in 1951, 1953, 1955, and 1956, proved to be rewarding and worthwhile.¹

Due to the large size and the multiple and complex branching of some species of *Pteris* it is often difficult to obtain satisfactory specimens, and frequently only the extreme upper portion of a frond or a single pinna is found on herbarium sheets. The specimens that have been seen and cited here are from the U. S. National Herbarium, the Gray Herbarium, and a few from the New York Botanical Garden.

They are arranged geographically and listed under the seven provinces into which Costa Rica is divided — Limón on the Atlantic, Guanacaste and Puntarenas on the Pacific, and Heredia, Alajuela, San José and Cartago in the interior of the country.

The habitat and altitude given for each species refer only to the specimens seen from Costa Rica.

PTERIS L.

A large genus of mostly coarse ferns, herbaceous to coriaceous, with erect or ascending fronds. Blades 1-4-pinnate, often only the basal parts decomposed; veins all free, or only the basal pair joined, or joined in several rows of angular areoles. Sori linear and continuous, but not usually reaching the apices and sinuses of the segments, sporangia borne

¹I was greatly aided during my experiences in the field by Dr. Leslie R. Holdridge of the staff of the Interamerican Institute of Agricultural Sciences at Turrialba, who was most generous in sharing with me his time and his knowledge of the country, and in providing means of transportation for procuring desired specimens.

To Dr. Rolla M. Tryon of Harvard University I am deeply indebted for his continued interest in this project and for his stimulating suggestions and help in many ways. The drawings were prepared by Mrs. Joyce Todd, most of them for Dr. Tryon's *Ferns of Peru*.

on a marginal connecting-vein, protected by the membranous, reflexed margin, which serves as an indusium.

KEY TO SPECIES

- a. Pinnae (at least above the basal ones) entire, narrowly linear, not lobed or pinnatifid. b.
 - b. Fronds large, usually over 1 m. long; veins freely areolate toward the margins.....1. *P. grandifolia*.
 - b. Fronds small, rarely up to 1 m. long; veins all free.....2. *P. cretica*.
- a. Pinnae (at least above the basal ones) deeply pinnatifid or more deeply divided. c.
 - c. Veins all free. d.
 - d. Basal pinnae deeply pinnatifid beyond the basal pinnules. e.
 - e. One or two veins between costules arising from the costa of the pinna (at least toward base of pinna). Fig. 4. f.
 - f. Sinuses mostly asymmetrical, pinna axils smooth to slightly muricate.....3. *P. paucinervata*.
 - f. Sinuses uniformly symmetrical, pinna axils strongly muricate.....4. *P. pungens*.
 - e. Veins all arising from the costule (of the pinnule). Fig. 5b.5. *P. quadriaurita*.
 - d. Basal pinnae regularly pinnate-pinnatifid beyond the basal pinnules. g.
 - g. Leaf-tissue coriaceous; segments acute and mucronate; short, firm awns on the upper surface of the costae; rachises and costae muricate beneath.....6. *P. muricata*.
 - g. Leaf-tissue soft, herbaceous; segments obtuse, crenulate at the apex; long, soft, whitish awns on the upper surface of the costae; rachises and costae smooth beneath.....7. *P. muricella*.
 - c. Veins joined (at least along the costae; fig. 8b). h.
 - h. Basal pinnae pinnatifid beyond the basal pinnules; basal veins joined in a narrow costal arc, the others free.....8. *P. biaurita*.
 - h. Basal pinnae pinnate-pinnatifid (or more divided) beyond the basal pinnules; veins joined in several rows of angular areoles. i.
 - i. Basal veins monoarculate, one large areole along the costa between the costules. j.
 - j. Pinnatifid pinnae with the herbaceous tissue decurrent onto the rachis, especially in the apical ones.....9. *P. propinqua*.
 - j. Pinnatifid pinnae with the herbaceous tissue not decurrent onto the rachis. k.
 - k. Apex of ultimate segments crenulate. 1.
 - 1. Ultimate segments usually 5-10 cm. long (rarely 3 cm.), pinnatifid pinnae or pinnules definitely petiolulate, usually once pinnate at the base 10. *P. livida*.

1. Ultimate segments usually about 1 cm. long (rarely to 2 cm.), pinnatifid pinnae or pinnules sessile or some shortly petiolulate, usually pinnatifid to the base.
.....13. *P. tripartita*.
- k. Apex of ultimate segments sharply serrate. Segments numerous, close, oval-falcate, leaf-tissue coriaceous.....
.....12. *P. podophylla*.
- i. Two or more long areoles along the costa between costules. Segments lance-attenuate, oblique, sterile tips sharply serrate, leaf-tissue firm-herbaceous.....11. *P. altissima*.

1. PTERIS GRANDIFOLIA L. Sp. Pl. 2: 1073. 1753

A large fern, simply pinnate, with long narrow pinnae, mostly oblique, with entire thinly cartilaginous margins and sori continuous nearly to the attenuate tips. The veins are close and parallel, free near the costa, but anastomosing toward the margin. The rhizome is stout and creeping; the texture of the pinnae is membrano-herbaceous and translucent.

Mexico to Panama, to Peru; West Indies.

Specimens seen: ALAJUELA: Cebadilla, *Valerio 278* (US); Gorges of Machuca River near San Mateo, *Biolley 2019* (US), Río Machuca, *Biolley 17389* (GH, NY, US).

2. PTERIS CRETICA L. Mant. 130. 1767

This well-known fern of wide distribution is characterized by the lower pair or pairs of pinnae that are forked nearly to the base into long, narrow attenuate segments. The margins of the sterile pinnae and tips of the fertile ones are usually spinulose-serrated.

Tropical and subtropical regions in many parts of the world, either native or naturalized.

Rocky woods and forested slopes from 1600 to 1900 m.

Specimens seen: CARTAGO: La Banderilla, *R. Torres 243* (US); Reventado, *Lankester 721* (US).

3. PTERIS PAUCINERVATA Fée, Mém. Fam. Foug. 8: 73. 1857

The stipe of this seemingly rare fern is reddish brown, erect from a short ascending rhizome, which has long concolorous brown scales. The terminal and lateral pinnae, usually 5-7 pairs, end in a long caudate tip; the linear-

oblong segments are decurrent at the base, the sterile ones with crenulate margins, the fertile ones slightly falcate. The lowest pinnae are irregularly forked; the texture of the

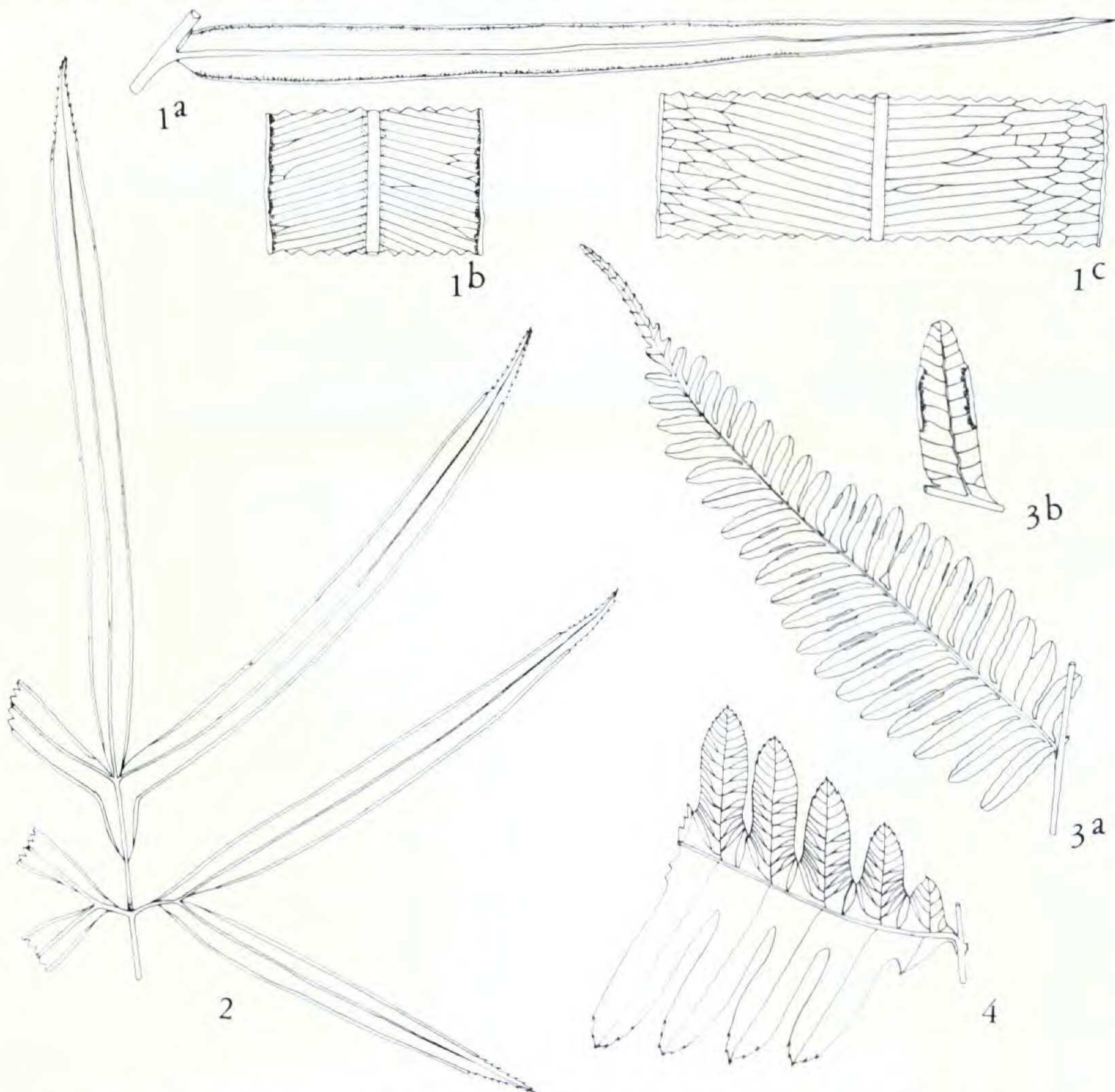


FIG. 1-4. Fig. 1. *P. grandifolia*: 1a, a fertile pinna, $\times 1/4$; 1b, portion of fertile pinna, $\times 1$; 1c, portion of sterile pinna, $\times 1$. Fig. 2. *P. cretica*: a fertile frond, $\times 1/2$. Fig. 3. *P. paucinervata*: 3a, a fertile pinna, $\times 1/2$; 3b, a fertile segment, $\times 1$. Fig. 4. *P. pungens*: base of sterile pinna, $\times 3/4$.

blade is subcoriaceous. Veins are few (hence the name) and conspicuous, well-spaced at the base; some of them arise from the costa.

This fern is variable and rare; perhaps it is a hybrid of *P. pungens* and *P. muricella* (or others).

Mexico to Panama.

Ravines in forests and on slopes of volcanoes from 1300 to 1800 m.

Specimens seen: HEREDIA: Vara Blanca de Sarapiquí, between Poás

and Braba volcanoes, *Skutch 3636* (US). SAN JOSE: Tablazo, *Valerio 265* (US).

4. *PTERIS PUNGENS* Willd. Sp. Pl. 5: 387. 1810

The erect stipe, which is castaneous at the base, is slightly muricate, as is the rachis especially at the axils of the pinnae. The pinnae are from 2-5 pairs, with only the lowest 2-partite. The linear-lanceolate obtuse segments are close, parallel, and have a regular appearance as compared with those of *P. paucinervata*.

As the rounded or pointed tubercles on the stipe and rachis can be observed in some other species, the distinguishing character of this *Pteris* is found in the short lowermost vein or veins which arise from the costa. The linear sori extend from the sinuses of the segments almost to its serrate tip.

Mexico to Panama, to Peru and Bolivia; West Indies.

In humid forests from 200 to 1100 m.

Specimens seen: LIMON: Tsâki, Talamanca, *Tonduz 9471* (US); Finca Montecristo, on the Río Reventazón below Cairo, *Standley & Valerio 48626* (US); Los Diamantes, Rubber Plant Station, *Scamman 5908, 7036* (GH); Hacienda Parismine Banana Co., *Jimenez 1060* (NY, US). HEREDIA: Santa Clara — Las Delicias, *Biolley 10683* (US); Finca La Selva, Río Puerto Viejo, *Scamman & Holdridge 7443, 7915* (GH). ALAJUELA: Llanuras de San Carlos, *Brade 314* (US); Surubres near San Mateo, Feb. 1906 *Biolley* (NY, US). SAN JOSE: San José, 1906 *Biolley* (US); Vicinity of El General, *Skutch 2200* (GH, NY, US). CARTAGO: Turrialba, *Maxon 182* (NY, US).

5. *PTERIS QUADRIAURITA* Retz. Obs. Bot. 6: 38. 1791

This common, widely distributed fern varies greatly in size from 15 cm. to 1 m. The leaf has 7-15 pairs of pinnae, and the basal pair are 2-partite; it is suberect from a woody rhizome clothed with small, acicular dark scales with lighter margins. The segments are oblong to linear, rounded-obtuse, thin to firm-herbaceous and translucent.

Mexico to Panama, to Brazil; West Indies. Tropics of Old World.

On shaded stream banks and in deep ravines from 1000 to 1800 m.

Representative specimens: 1901-1905 *Wercklé* (NY, US). LIMON:

Talamanca, *Tonduz* 8579 (US). HEREDIA: Confluence of Río Puerto Viejo and Sarapiquí, *Pittier* 7475 (US); Barba, *Scamman* 7038 (GH). ALAJUELA: Alajuela, *Alfaro* 6045 (GH, US); La Verbena près Alajuelita, *Tonduz* 8791 (US); Near Zapote, *Scamman* 7622 (GH); San Ramón, *Tonduz* 17581 (NY, US). SAN JOSE: Aserri, *Hunnewell* 16535 (GH); San Sebastian near San José, *Standley* 49294 (US); Río Torres, *Alfaro* 12, 18 (US); Forêts du Copey, *Tonduz* 11684 (US); Santa Ana, *Scamman* 5906 (GH); Finca Ortuna, Desamparados, *Scamman & Holdridge* 7916 (GH). CARTAGO: Navarro, *R. Torres* 58 (US); Juan Viñas, *Cook & Doyle* 187, 200, 241 (US); Cerro de La Carpintera, *Standley* 34270 (US); Turrialba, *Scamman* 5904, 5907 (GH); Tapanti, in Valley of Río Reventazón, *Scamman & Holdridge* 7917 (GH). PUNTARENAS: Cours supérieur du Diquís, *Pittier* 10571 (US).

6. PTERIS MURICATA Hook. Sp. Fil. 2: 193. 1858

Commonly called *P. coriacea* Desv. (a South American species).

The stipe which is dark chestnut at the base arises from a thick, woody rhizome with dark scales with light dentate margins. Both stipe and rachis are flexuous with the coriaceous pinnae stalked at the base, the lower pair bi- to tripinnate. Segments are linear-oblong, subfalcate, mucronate at the tip. This species is characterized by the hard spinous points on the rachises and costae.

Costa Rica to Panama, to Peru and Bolivia.

In wooded ravines and moist forests at high altitudes from 1300 to 3000 m.

Specimens seen: Costa Rica 1901-1905 *Wercklé* (US), Vicinity of Coliblanco, *Maxon* 314 (NY, US). HEREDIA: Volcán Barba, *R. Torres* 229 (US). ALAJUELA: Candelaria, *Hoffmann* 889 (US). SAN JOSE: Forêts du Copey, *Tonduz* 11898 (US); La Hondura, *Standley* 37721 (GH, US), Along the road to La Hondura, *Scamman & Holdridge* 7912 (GH). CARTAGO: Cerro de La Carpintera, *Standley* 34489 (US); Robert's on the road to Volcán Irazú, *Scamman* 5903 (GH).

7. PTERIS MURICELLA Fée, Mém. Fam. Foug. 8: 73. 1857

Pteris mollis Christ, Bull. Herb. Boiss. 4: 658. 1896. Costa Rica: Forêts de San Marcos, *Tonduz* 7565; isotype US!

This fern is unusual and distinctive among Costa Rican *Pteris* because of the soft and delicate tissue. The smooth, reddish-brown stipes rise erect from a thick rhizome with concolorous brown scales; segments are oblong, obtuse, crenulated at the apex, with the sori occupying only the middle

of the lobes. Long soft awns are common on the costae on their upper surface.

Mexico to Panama.

In moist dense forests from 1000 to 1800 m.

Specimens seen: 1901-1905 *Wercklé* (US). ALAJUELA: La Palma, near San Ramón, *Brenes 5364* (GH, US); Santiago, near San Ramón, *Tonduz 17582* (US); Zarcerro, Jan. 19 & 30, 1948, *Austin Smith* (US). SAN JOSE: Forêts de San Marcos, *Tonduz 7565* (US); Vicinity of Santa María de Dota, *Standley 41863* (GH, US); Cultures du Copey, *Tonduz 11705* (US); Vicinity of El General, *Skutch 2240* (GH, NY, US). CARTAGO: Valle del Río Navarro, *Wercklé 16771* (US).

8. PTERIS BIAURITA L. Sp. Pl. 2: 1076. 1753

The stipe and rachis are light-colored, rising from a sub-erect, woody rhizome; the blade may have from 5-15 pairs of opposite pinnae, the basal pair 2-partite; segments oblong to linear, obtuse, with entire margins, the fertile with rounded sinuses, the sterile acute. In this species only the basal veins are joined in a narrow costal arc.

Mexico to Panama to Brazil; West Indies. Tropics of Old World.

In light woods at edge of forest; wet thickets, from 100 to 1000 m.

Specimens seen: LIMON: La Colombiana Farm of United Fruit Co., *Standley 36715* (US); Port Limón, June 15, 1874, *Kuntze* (NY). ALAJUELA: Surubres près de San Mateo, *Pittier 7009* (US), Surubres near San Mateo, Feb. 1906 *Biolley* (NY, US); La Palma de San Ramón, *Brenes 6396* (NY); San Pedro de San Ramón, *Brenes 15085* (NY). SAN JOSE: El General, *Skutch 2203, 2224, 3931* (GH, NY, US). GUANACASTE: Nicoya, *Cook & Doyle 678* (US).

9. PTERIS PROPINQUA Ag. Rec. Spec. Gen. Pterid. 65. 1839

Pteris costaricensis Rosenst. Fedde Rep. Spec. Nov. 22: 7. 1925. Costa Rica, *Brade 461*; isotype NY!

Stipe and rachis smooth, light-colored to the base; scales on the rhizome with dark centers; frond bipinnate below with especially the upper pinnae decurrent to the rachis; segments lanceolate, subfalcate, rather obtuse, mucronate and sharply serrated. Basal veins monoarculate.

Mexico to Panama, to Brazil; West Indies.

In other Central American countries it has been found in open places and swamps from sea level to 300 m.

Specimen seen: ALAJUELA: Llanuras de San Carlos, *Brade* 461 (NY).

10. *PTERIS LIVIDA* Mett. Ann. Sc. Nat. V. 2: 222. 1864

Blades tripartite, the pinnatifid pinnae petiolulate, the long segments usually cut to the rachis at the base of their pinna; sori not reaching the inciso-crenate tips. The vivid green color of the leaf-tissue is distinctive.

Costa Rica to Peru and Bolivia.

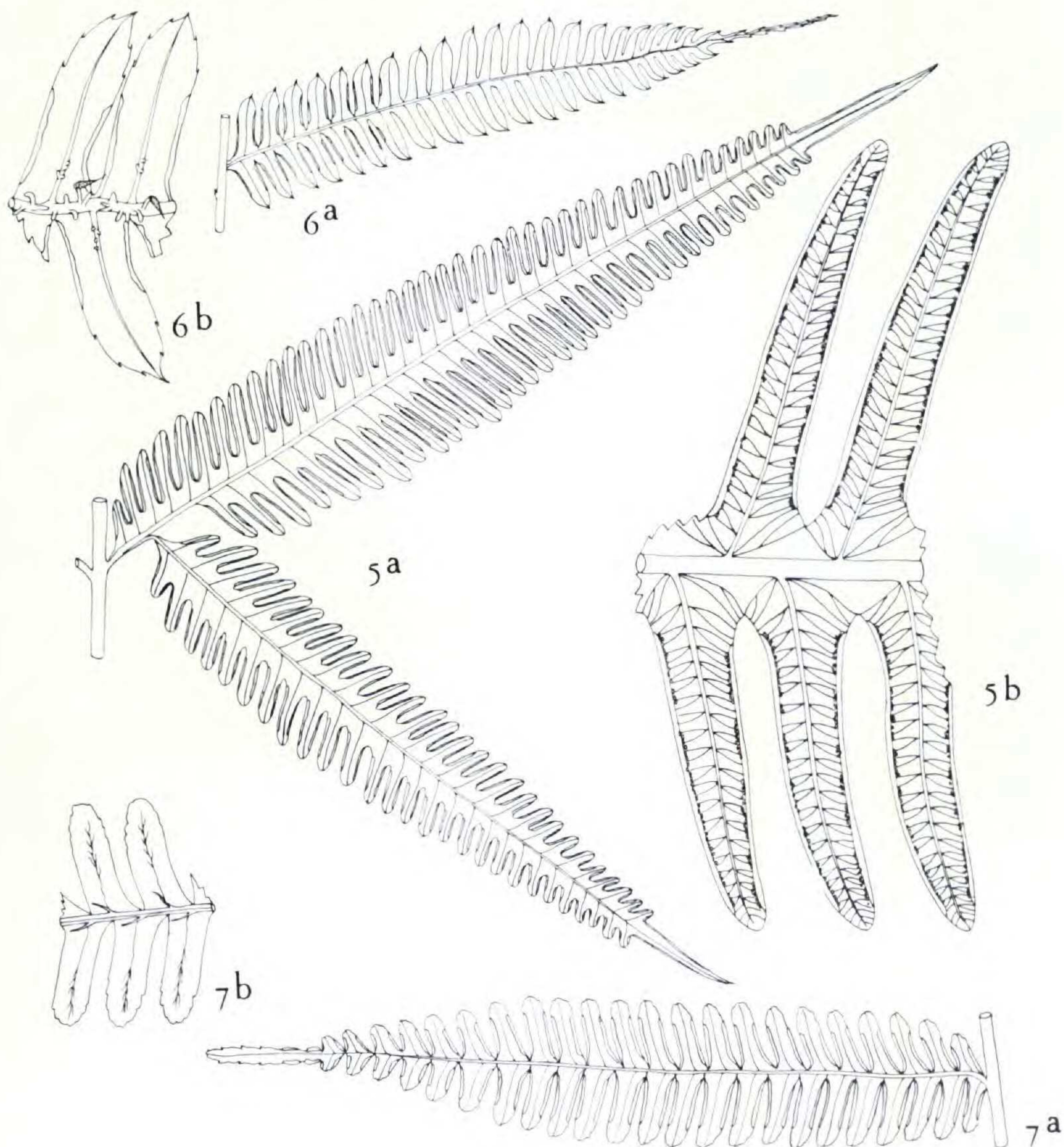


FIG. 5-7. Fig. 5. *P. quadriaurita*: 5a, a fertile basal pinna, $\times 1/2$; 5b, portion of fertile pinna, $\times 1\ 1/2$. Fig. 6. *P. muricata*: 6a, a fertile pinna, $\times 1/2$; 6b, portion of a pinna with muricated points on costa beneath, $\times 2$. Fig. 7. *P. muricella*: 7a, a fertile pinna, $\times 3/4$; 7b, portion of a pinna with awns on costa above, $\times 1$.

In ravines and damp forests in mountains from 900 to 2700 m.

Specimens seen: 1901-1905 *Wercklé* (US). Vara Blanca between Poás and Barba, *Scamman 7035* (GH); Along cart-road from Vara Blanca to La Concordia, *Maxon & Harvey 8482* (US). SAN JOSE: El Copey, *H. E. Stork 1549* (US); La Palma, *Brade 26* (US); San Jerónimo, *Wercklé 580* (US). CARTAGO: Santa Clara de Cartago, *Lankester 711* (GH, US); Forêts du Turrialba, *Pittier 849* (US); Forêts du Roble, Massif de l'Irazú, *Pittier 4179* (US).

11. PTERIS ALTISSIMA Poir. in Lam. Encycl. 5: 722. 1804

Pteris Kunzeana Ag. Rec. Spec. Gen. Pterid. 62. 1839.

This large fern, sometimes reaching a height of 2 m., is the most common and widely distributed *Pteris* in Costa Rica. The blade is deltoid-ovate, broad, to tripinnate at the base, the basal pinnae are much the largest. The straw-colored stipe rises from a short, erect rhizome with shiny castaneous scales with a lighter dentate margin. The leaf-tissue is firm-herbaceous to subcoriaceous.

The pinnae and pinnules vary greatly in shape and general aspect in different fronds, but the character which distinguishes this from other similar species of *Pteris* is the 2-3-arcuate basal veins.

Mexico to Panama, to Brazil and Bolivia; West Indies.

In ravines and on hillsides in wet forests from 250 to 2200 m., from all the provinces of Costa Rica.

Representative specimens: LIMON: Forêts de Tsâki, Talamanca, *Tonduz 9440* (US); Los Diamantes, *Holm & Iltis 369* (NY, US), Los Diamantes, *Scamman 7034* (GH). HEREDIA: Yerba Buena, northeast of San Isidro, *Stanley & Valerio 49235* (GH, US); La Concepción, Llanuras de Santa Clara, *J. D. Smith 6870* (GH, US); Vara Blanca de Sarapiquí, *Skutch 3578* (GH, NY, US), Vara Blanca between Poás and Barba, *Maxon & Harvey 8337* (US); Cinchona, *Scamman 7619* (GH); La Paz-Waterfall, *Scamman & Holdridge 7910* (GH). ALAJUELA: Region of Zarcero, *Austin Smith 383* (GH); Surubres près San Mateo, *Biolley 6* (US). SAN JOSE: Las Nubes, *Scamman & Holdridge 7908* (GH); La Palma, *Scamman 7618* (GH), *Maxon & Harvey 7999* (US); Cerro Turrubares, Orotina, *Jimenez 600* (US); Finca Ortuna, Desamparados, *Scamman & Holdridge 7909* (GH). CARTAGO: Estrella, *Cooper 6044* (GH, NY, US); Navarro Valley, *H. E. Stork 1405* (GH); San Juan del Norte, *Scamman 7620* (GH); Forêts de Juan Viñas, Jan. 25, 1890, *Pittier* (US), Juan Viñas, *Cook & Doyle 212* (US). GUANACASTE: Cafetales at Hacienda Granadilla, *Dodge & Thomas 6421* (GH); Upper

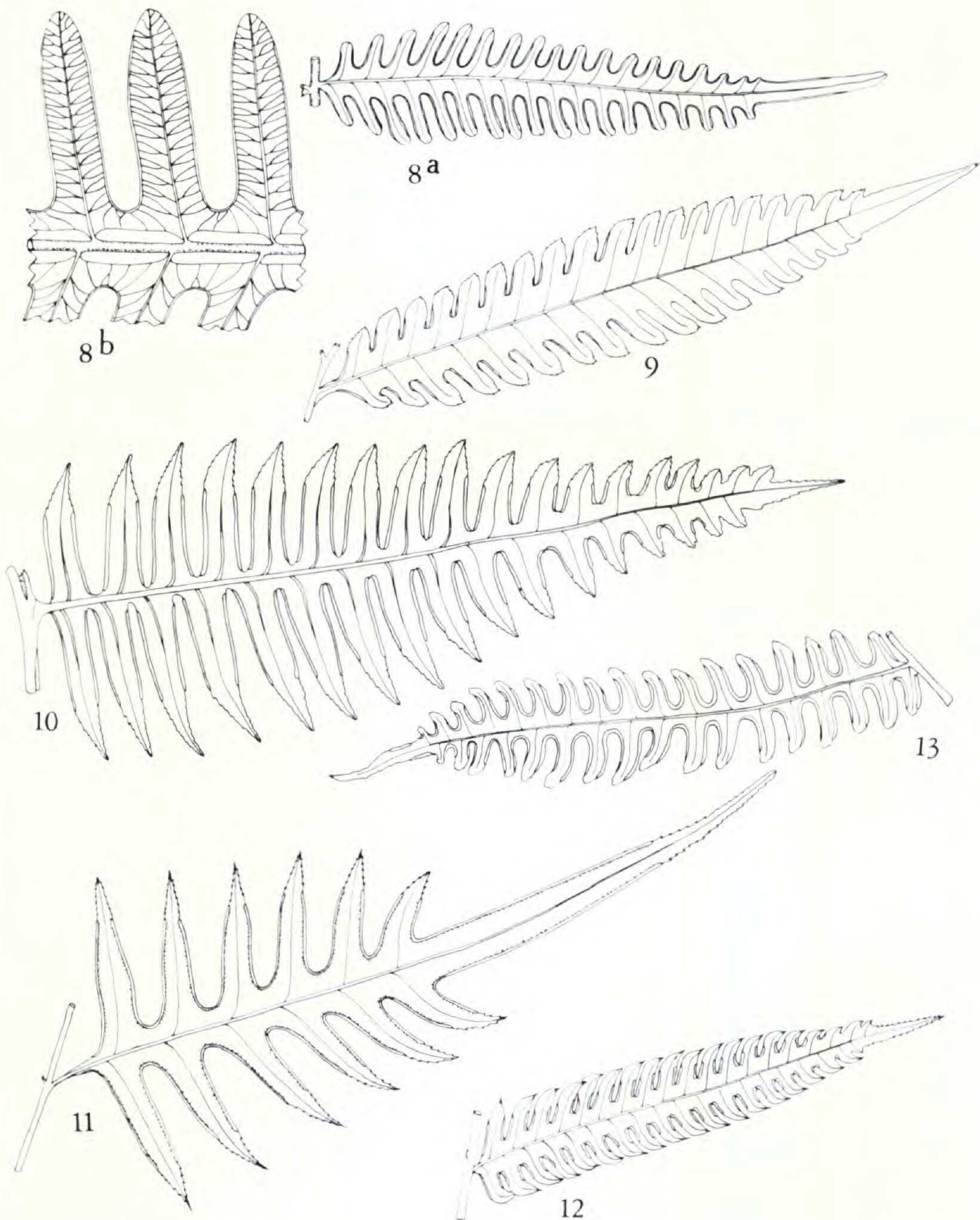


FIG. 8-13. Fig. 8. *P. biaurita*: 8a, a fertile pinna, $\times 1/2$; 8b, portion of a fertile pinna, $\times 1\ 1/2$. Fig. 9. *P. propinqua*: a fertile pinna, $\times 3/4$. Fig. 10. *P. livida*: a fertile pinna, $\times 1/4$. Fig. 11. *P. altissima*: a fertile pinna, $\times 1/2$. Fig. 12. *P. podophylla*: a fertile pinna, $\times 1/2$. Fig. 13. *P. tripartita*: a fertile pinna, $\times 1/2$.

slopes of Cerro San José de Libano, *Dodge, Hanckel & Thomas 7878* (GH). PUNTARENAS: Between Golfo Dulce and Río Terruba, *Skutch 5412* (US).

12. PTERIS PODOPHYLLA Sw. Schrad. Journ. 1800.² 67. 1801

A tall conspicuous fern often growing at the edge of a forest, in the mountains. The wide frond is ternately divided, the lateral divisions 3-4-partite, the central one pinnate-pinnatifid. The stipe is stout, thick and tawny, about 1 m. high, and somewhat muricated at the base. The linear-oblong falcate segments are regularly spaced on the costae with rounded sinuses, the sterile ones are finely spinulose-serrate as are the fertile near their tip. Texture is thick, coriaceous, and the basal veins are monoarculate.

Mexico to Panama, to Peru and Bolivia; West Indies.

In partial shade at edges of forests and in clearings usually from 1000 to 2400 m.

Specimens seen: 1901-1905 *Wercklé* (US). HEREDIA: Confluence of Río Puerto Viejo and Sarapiquí, *Pittier 7491* (US); Cart road from Vara Blanca to La Concordia, *Maxon & Harvey 8475* (US). SAN JOSE: Santa María de Dota, *Standley 43335* (GH, US); Forêts du Copey, *Tonduz 11718* (US), El Copey, *Jimenez 1107* (GH, US); Dans les bois humides à la Palma, *Pittier 710* (US), Vicinity of La Palma, *Maxon & Harvey 8083* (US); Highway near La Chonta, *Scamman 5905* (GH); Rancho Redondo, on slope of Irazú, *Scamman & Holdridge 7621* (GH). CARTAGO: Forêts del Roble, Massif de l'Irazú, *Tonduz (Pittier) 4189, 4190* (NY, US); Forêts entre la Turrialba à la Río Birrio, *Pittier 845* (US); Finca Navarro, *Maxon 629* (NY, US).

13. PTERIS TRIPARTITA Sw. Schrad. Journ. 1800.² 67. 1801

This fern has often been described as "gigantic" or giant bracken. The leaves reach 2 m. or more in height from a very stout rootstalk. Fronds are tripartite, the pinnatifid pinnae more or less sessile. The short ultimate segments are linear-oblong, falcate, obtuse or acute, crenulate only at the tip, and regularly spaced and evenly cut by obtuse sinuses usually at some distance from the costa.

A widely distributed fern, native to the Tropics of the Old World — Asia, Africa, Australia, Polynesia, etc. — but found as an escape occasionally in the New World, including cypress swamps and wet hammocks of Florida, and rarely in Central and South America.

Specimens seen: CARTAGO: Tapanti, in Valley of Río Reventazón, *Scamman & Holdridge 7913* (GH); Orosi, *Scamman & Holdridge 7914* (GH).

Other species of *Pteris* described from Costa Rica are the following. They are probably synonyms of some of the species mentioned here, but the types have not been seen.

P. longicaudadel Christ, in Pitt. Prim. Fl. Costar. 3: 21. 1901. Costa Rica, Forêts de Santo Domingo de Osa, Mars. 1896, *Tonduz 10071*. Cited as a synonym of *P. pungens* by Maxon. Sci. Sur. Porto Rico and V. I. 6: 434.

P. macrodictya Christ, Bull. Herb. Boiss. II, 7: 267. 1907. Costa Rica, 1904, *Wercklé*. Probably = *P. grandifolia*.

P. navarrensis Christ, Bull. Soc. Bot. Genève II, 1: 227. 1909. Costa Rica, Valle del Río Navarro, 1400 m., *Wercklé 16761*. Probably = *P. podophylla*.

P. prolifera J. E. Bomm., Bull. Soc. Bot. Belg. 35: 189. 1896, in synonymy. Costa Rica, Juan Viñas, *Pittier 1841*. It is a proliferous phase of *P. quadriaurita* or perhaps of a species of another genus. — GRAY HERBARIUM, HARVARD UNIVERSITY.

OMISSIONS IN KEY TO XYRIS IN FLORIDA. — In *Rhodora*, Vol. 62, No. 743, 1960, two portions of the key to Florida Xyris were omitted from the manuscript, through an oversight. On page 300, there should be a second 3 just above the first 4 which should read "3. Plants tuberculate-roughened only on scape ridges and/or leaf margins." On page 301, the second "15" should end with 14. *X. smalliana*. — R. KRAL.